Provisions for Net Metering Arrangement in view of Uttar Pradesh Solar Policy

1. Introduction/ Background

1.1 The UPERC (Rooftop Solar PV Grid Interactive System Gross/ Net Metering) Regulation, 2019 was notified on 04.01.2019. The said Regulations provided framework for Net Metering and Gross Metering arrangements. As per the Regulations, the Net Metering facility was made available only to metered agriculture consumers under LMV-5 category or metered residential/ domestic consumer under LMV-1 category.

1.2 Subsequently, UPERC (Rooftop Solar PV Grid Interactive System Gross/ Net Metering) Regulation, 2019 (First Amendment / Addendum), notified on 01.06.2022, provided for Net billing / Net feed-in arrangement. Accordingly, at present there are three different arrangements under which Rooftop Solar Photo Voltaic (RSPV) plants could be installed. These are as below:

RSPV Arrangement	Eligibility
Net Metering	metered agriculture consumers under LMV-5 category or metered residential/ domestic consumer under LMV-1 category
Gross Metering	All consumer categories
Net billing / Net feed-in	All consumer categories

1.3 Further, the Regulation 5.1 provides that the capacity of RSPV system cannot exceed the contracted/ connected demand of the consumer in following manner:

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> *5 Capacity of Rooftop PV system*
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> *5.1 The maximum peak capacity of the grid connected rooftop solar PV system to be installed by any eligible consumer shall not exceed 100% of the connected/ contracted demand of the consumer.*

Provided the capacity of the grid connected rooftop solar PV system to be installed by any eligible consumer or third party owner shall not be less than 1 kWp and shall not exceed 2 MWp

5.2 Provided that the capacity of the grid connected rooftop solar PV system shall be in conformity with the provisions relating to the connected load or contracted demand permissible under the UPERC (Electricity Supply Code) Regulations, 2005 and subsequent amendments thereof.
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1.4 The provisions of Net Metering under UP Solar Policy 2022 that are proposed to be adopted is given in point 2 below.

2. UP Solar Policy 2022

2.1 The Government of Uttar Pradesh has framed UP Solar Policy 2022, which has to remain in operation for a period of five (5) years or till the Government notifies the new policy. The para 7 of the Solar Policy provide details of the consumer types that will be covered by the policy for net metering arrangement, which is quoted below:

7.1 Non Residential Institutions.
The Government of Uttar Pradesh shall promote deployment of rooftop solar photovoltaic plants for captive/self-consumption under Net metering arrangement on the office buildings of institutions as follows: -

a) State Government buildings/office buildings or premises under the control of the State Government/office buildings of the Government of India or other Provincial Government located in the State.

b) Government and non-government educational institutions of all categories, which are regulated by the regulatory bodies of the Central Government / State Government.

c) Net metering will not be allowed, in case above category institutions are operating in private rented building.

d) Example: - State government schools, colleges, technical institutions and universities, all public institutions hostels, training institutions, libraries and establishments of Indian Railways located in the state, research and development institutions, holiday homes, guest houses, Inspection buildings etc. which come under the purview of the government. Government Schools, Colleges, Government Hospitals, Jails, Private

Educational Institutions like Schools, Colleges, Universities, Nursing colleges etc .

e) Installation of Rooftop solar photovoltaic plants through third party (RESCO mode) {Renewable Energy Supply Company} will be encouraged in these Institutes. In this arrangement power purchase agreement between consumer and Third Party (RESCO) will be executed and Net-Metering interconnection agreement between consumer and electricity Distribution Company will be executed.

f) Institutions can install rooftop solar plants in RESCO mode by themselves or in consultation with UPNEDA. Consultancy fee 3% cost of the plant and applicable GST/other tax will be payable to UPNEDA.

g) A revenue model will be developed for installation of systems whereby Nodal Agency, UPNEDA will play an active role in collection of demand for installation of Grid connected Solar Rooftop Power Plants. UPNEDA will develop model contracts, Standard PPA's and will carry out competitive bidding for discovery of tariff and selection of RESCO's for implementation of Grid connected Solar Rooftop Projects.

h) As per RSPV Regulation -2019, issued by UPERC and amended from time-to-time, Net billing facility will be provided to industrial and commercial consumers. UPERC will determine the tariff for power purchase by Discom.

3. Amendment required in Regulations

3.1 The Regulations merit an amendment from the perspective of eligibility to include consumers covered by para 7.1 These consumers fall under LMV-4 and HV-1 category of Rate Schedule. LMV-4 and HV-1 category of Rate Schedule is reproduced below wherein the words and subcategories, under which government institutions and educational institutions fall, have been highlighted:

LMV-4: LIGHT, FAN & POWER FOR PUBLIC INSTITUTIONS AND PRIVATE INSTITUTIONS:

APPLICABILITY:

Applicable for load less than 75 kW.

LMV-4 (A) - PUBLIC INSTITUTIONS:

This schedule shall apply to:

(a) Government Hospitals / Government Research Institutions / Offices of the Government Organizations other than companies registered under Companies Act 1956.

(b) Government & Government aided (i) Educational Institutions (ii) Hostels (iii) Libraries.

…

(d) Railway Establishments (excluding railway traction, industrial premises & Metro) such as Booking Centres, Railway Stations & Railway Research and Development Organization, Railway rest houses, Railway holiday homes, Railway inspection houses.

(e) All India Radio and Doordarshan.

(f) Guest houses of Government, Semi-Government, Public Sector Undertaking Organisations.

LMV-4 (B) - PRIVATE INSTITUTIONS:

This schedule shall apply to non-Government hospitals, nursing homes / dispensaries / clinics, ***private research institutes, and schools / colleges / educational institutes*** & charitable institutions / trusts not covered under (A) above.

HV-1 NON - INDUSTRIAL BULK LOADS

APPLICABILITY:

This rate schedule shall apply to:

(a) Commercial loads (as defined within the meaning of LMV-2) with contracted load of 75 kW & above and getting supply at single point on 11 kV & above voltage levels.

(b) Private institutions* (as defined within the meaning of LMV-4 (b)) with contracted load of 75 kW & above and getting supply at single point on 11 kV & above voltage levels.

[underlined sub category in LMV-4B]*

(c) Non domestic bulk power consumer (other than industrial loads covered under HV-2) with contracted load 75 kW & above and getting supply at single point on 11 kV & above voltage levels and feeding multiple individuals (owners / occupiers / tenants of some area within the larger premises of the bulk power consumer) through its own network and also responsible for maintaining distribution network.

(d) Public institutions (as defined within the meaning of LMV-4 (a)) with contracted load of 75 kW & above and getting supply at single point on 11 kV & above voltage levels.

The institution / consumer seeking the supply at Single point for non-industrial bulk loads under this category shall be considered as a deemed franchisee of the Licensee.

(e) Registered Societies, Residential Colonies / Townships, Residential Multi-Storied Buildings with mixed loads (getting supply at single point) with contracted load 75 kW & above and getting supply at single point on 11 kV & above voltage levels and having less than 70% of the total contracted load exclusively for the purposes of domestic light, fan and power. Figure of 70%, shall also include the load required for lifts, water pumps and common lighting,

(f) For Offices / Buildings / Guesthouses of UPPCL / UPRVUNL / UPJVNL / UPPTCL / Distribution Licensees having loads above 75 kW and getting supply at 11 kV & above voltages.

3.2 In view of the above, the proposed amendment is as below:

Regulation No.	Existing Regulation	Amended Regulations
Definitions and Interpretations	2.k) "Eligible consumer" for i)Gross Metering Scheme means a prosumer of electricity of any category in the area of supply of the Distribution Licensee, who intends to/ has set up a grid connected rooftop Solar PV system in his/ her premises which can be self-owned or third party owned, with an intent to sell the entire electricity to the distribution licensee at the rate prescribed by the Commission. ii) **net-billing / net feed-in** scheme means a prosumer of any category, in the area of supply of the Distribution Licensee, who intends to/ has set up a grid connected rooftop Solar PV system in his/ her premises, which can be self-owned or third party owned, where-in the energy imported from the Grid and energy exported to the Grid Interactive rooftop Solar photovoltaic system of a Prosumer are measured through a single bi-directional energy meter valued	2.k) "Eligible consumer" for i)Gross Metering Scheme means a prosumer of electricity of any category in the area of supply of the Distribution Licensee, who intends to/ has set up a grid connected rooftop Solar PV system in his/ her premises which can be self-owned or third party owned, with an intent to sell the entire electricity to the distribution licensee at the rate prescribed by the Commission. ii) **net-billing / net feed-in** scheme means a prosumer of any category, in the area of supply of the Distribution Licensee, who intends to/ has set up a grid connected rooftop Solar PV system in his/ her premises, which can be self-owned or third party owned, where-in the energy imported from the Grid and energy exported to the Grid Interactive rooftop Solar photovoltaic system of a Prosumer are measured through a single bi-directional energy meter valued

	at two different Tariffs which are determined by the Commission. iii)Net Metering Scheme means the metered prosumers of a Licensee under agriculture (LMV-5) category or domestic consumers under LMV-1 category, who intends to/ has set up a grid connected rooftop solar PV system in the consumer premises, which can be self-owned or third party owned wherein the energy imported from the grid and the energy exported to the grid interactive rooftop solar PV system are netted out through single bi-directional energy meter.	at two different Tariffs which are determined by the Commission. iii)Net Metering Scheme means the metered prosumers of a Licensee under agriculture (LMV-5) category or domestic consumers under LMV-1 category who intends to/ has set up a grid connected rooftop solar PV system in the consumer premises, which can be self-owned or third party owned wherein the energy imported from the grid and the energy exported to the grid interactive rooftop solar PV system are netted out through single bi-directional energy meter. **Net metering scheme shall also be available to** (I) **All Public Institutions covered under LMV-4A consumer category of the Rate Schedule except such consumers which are covered under LMV-4A(c) as provided in the Rate Schedule.** (II) **Private research institutes, and schools / colleges / educational institutes covered under Private Institutions under LMV-4B consumer category of the Rate Schedule** (III) **Public Institutions akin and similar to those mentioned in (I) above but covered under HV-1 consumer category of Rate Schedule.** (IV) **Private Institutions akin and similar to those mentioned in (II) above but covered under HV-1 consumer category of Rate Schedule.**

	2.t) **"Net Metering"** means an arrangement for measurement of energy in a system under which rooftop solar PV system installed at metered agriculture (under LMV-5 category) or metered residential/ domestic consumer premises (under LMV-1 category) delivers surplus electricity, if any, to the Distribution Licensee after off-setting the electricity supplied by Distribution License during the applicable billing period.	2.t) **"Net Metering"** means an arrangement for measurement of energy in a system under which rooftop solar PV system installed at **eligible consumer's premises (as given at 2.k) iii))**delivers surplus electricity, if any, to the Distribution Licensee after off-setting the electricity supplied by Distribution License during the applicable billing period.

4. Cost Benefit Analysis for Distribution Licensee

4.1 For carrying out the cost benefit analysis for incorporation of above sub categories, the rate schedule of LMV-4 & HV-1 category, the billing determinants of govt. institutions and educational institutions falling in these rate schedules and ACOS (average cost of supply) & ABR (average billing rate) falling under the respective rate schedule categories merit consideration.

A. The Rate Schedules for LMV-4 and HV-2 Categories are shown below:

LMV-4 - LIGHT, FAN & POWER FOR PUBLIC INSTITUTIONS AND PRIVATE INSTITUTIONS

Description	Fixed Charge	Energy Charge
(A) For Public Institutions	Rs. 300.00 / kW / month	Rs. 8.25 / kWh
(B) For Private Institutions	Rs. 350.00 / kW / month	Rs. 9.00 / kWh

HV-1 - NON - INDUSTRIAL BULK LOADS

(a) Commercial Loads / Private Institutions / Non - domestic bulk power consumer with contracted load 75 kW & above and getting supply at Single Point on 11 kV & above:

Contracted Load	Fixed Charge	Energy Charge
For supply at 11kV	Rs. 430.00 / kVA / month	Rs. 8.32 / kVAh

For supply above 11kV	Rs. 400.00 / kVA / month	Rs. 8.12 / kVAh

(b) Public Institutions, Registered Societies, Residential Colonies / Townships, Residential Multi-Storied Buildings including Residential Multi-Storied Buildings with contracted load 75 kW & above and getting supply at Single Point on 11 kV & above voltage levels:

Contracted Load	Fixed Charge	Energy Charge
For supply at 11kV	Rs. 380.00 / kVA / month	Rs. 7.70 / kVAh
For supply above 11kV	Rs. 360.00 / kVA / month	Rs. 7.50/ kVAh

B. Billing determinants* of the consumers, i.e., Govt. institutions & educational institutions for FY 2022-23 of UPPCL/ State Discoms, who will be covered under the provisions of the policy as has been discussed above, are enumerated as below:

Consumer Category	Number	Load (MW)	Sales (Mus)
Public Institutions (LMV-4A)	1,78,606	530.214	965.75
Private Institutions (LMV-4B)	17,539	173.746	270.58
Public & Private Institutions (HV-1)	6,145	2164.744	1991.36
Total	202,290	2,869	3,228

* As per information provided by UPPCL

C. ACOS & ABR

The details of estimated ACOS for UPPCL/ State Discoms and ABR for LMV-4 and HV-1 consumer categories is as below:

Average Cost of Supply	Rs. 7.46/ kWh
ABR for LMV-4A	Rs. 10.19/ kWh
ABR for LMV-4B	Rs. 11.44/ kWh
ABR for HV-1	Rs. 9.75/ kWh

As can be seen from above, LMV-4A, LMV-4B and HV-1 categories have ABR higher than ACOS. Accordingly, installation of RSPV system by these consumer categories would result in loss of revenue for Distribution Licensees.

4.2 Further, this fact should also be borne in mind that the Commission vide Order dated 01.08.2019 in Petition No. 1433 of 2019 has already decided that following consumers will be covered under earlier RSPV Regulations and will be eligible for Net Metering:

1. Consumers who had applied/ placed to Discoms for availing Net Metering before the notification of RSPV Regulation 2019.
2. Consumers who had placed order for Rooftop Solar Plant under CAPEX model and have made the payment for purchase order prior to notification of RSPV Regulation 2019.
3. Signed PPA with developers under RESCO model and the RESCO developer had already placed the site-specific purchase order prior to notification of RSPV Regulation 2019.

4.3 For evaluating the impact of proposed amendment for catering to the requirements of Uttar Pradesh Solar Policy 2022, broadly, we have to assess the impact on following two classifications of consumers:

A. Proposed consumers who are already having RSPV system installed under Net Billing / Net Feed-In arrangement.

B. Consumers who have yet not installed any RSPV system despite being eligible consumers.

4.4 Accordingly, the billing determinants of above two classifications along with the classification under which the consumers under Net Metering arrangement as per Commission's order dated 01 Aug 2019 are shown in following tables. This information has been provided by UPPCL.

Contracted Demand (MW)

	LMV-4A	**LMV-4B**	**HV-1**	**Total**
Total Contracted Demand **(D)**	530.02	173.746	2164.74	2868.50
Contracted Demand of Consumers under Net Metering arrangement (as per Order dated 01.08.2019 - **(D1)**	3.96	0.15	37.35	41.46

Contracted Demand of Consumers under net billing arrangement as mentioned in 4.3(A) - **(D2)**	0.54	0	2.4	2.94
Contracted Demand of Consumers not having RSPV system as mentioned in 4.3(B) - **(D3)**	525.52	173.59	2124.99	2824.10

Annual Consumption in Units (MUs)

	LMV-4A	**LMV-4B**	**HV-1**	**Total**
Total Annual consumption **(E)**	965.75	270.58	1991.36	3227.69
Total annual consumption of Consumers under Net Metering arrangement (as per Order dated 01.08.2019) **(E1)**	16.49	0.22	138.93	155.64
Total annual consumption of Consumers under net billing arrangement as mentioned in A) **(E2)**	0.95	0	6.97	7.92
Total annual consumption of Consumers not having RSPV system as mentioned in B) **(E3)**	948.31	270.36	1845.46	3064.13

Applicable tariff/ variable charges are given in the following table:

	LMV-4A	**LMV-4B**	**HV-1**
Net Metering Tariff (In case generation exceeds consumption) **(T1)**	2.00	2.00	2.00
Net Feed-in Tariff **(T2)**	3.58	3.58	3.58
Variable Charge under Tariff #**(T3)**	8.25	9.00	7.91*

#As there is no change in contracted demand (KW), the consumers will continue to pay the fixed charges even after installation of RSPV system however, there will be reduction in consumption of energy supplied by the licensee hence, only the impact of variable charge is to be considered.

** Average variable charge is considered for public and private institutions at 11kV as well as above 11kV*

4.5 Based on above billing determinants, total energy requirement and potential energy generation from the RSPV setup under LMV-4A, LMV-4B & HV-1 have been computed as below:

Details of Energy consumed and potential energy generation by consumers

		LMV-4A	**LMV-4B**	**HV-1**	**Total**
Contracted Demand of Consumers not having net metering arrangement **Dt** = (D2+D3)	MW	526.06	173.59	2127.39	2827.04

Total annual consumption of Consumers not having net metering arrangement (E2+E3)	MUs	949.26	270.36	1852.43	3072.05
% assumed for Conversion to Net Metering arrangement* (K2)	%	10%	10%	10%	10%
RSPV CUF assumption (F)	%	20%	20%	20%	20%
Total Energy Requirement $\mathbf{E_t}$ = K2*(E2+E3)		94.93	27.04	185.24	307.21
Potential Energy Generation through RSPV in above scenario ($\mathbf{E_{gen1}}$ = F*365*24* Dt*K2)	Mus	92.17	30.41	372.72	495.30

* The consumers that are being covered by the amendment are mostly government establishments. Such consumers normally witness funding constraints and hence gradual progress in installation of RSPV system is expected. In view of this, it is assumed that initially only around 10% of the consumers will be able to install RSPV system in a year and will be converted to net metering arrangement.

4.6 Considering that under net feed-in arrangement, the consumers will be consuming only 80% of the energy generated from RSPV system and rest 20% will be injected into the grid, the impact in case of net feed-in arrangement is shown below:

Calculations of energy parameters under net feed-in arrangement based on details from the table in point 4.5

		LMV-4A	**LMV-4B**	**HV-1**	**Total**
% assumption for Self Consumption of potential energy generation from RSPV system (S)	%	80%	80%	80%	80%
% of Energy Injected into grid of potential energy generation from RSPV system (I)	%	20 %	20%	20%	20%
Energy Consumed from RSPV $\mathbf{E_{cfi}}$ = (E_{gen1}) * S	MUs	73.73	24.33	185.24#	283.31
Energy Billed by Discom under net feed in $\mathbf{E_{bfi}}$ = E_t - E_{cfi}	MUs	21.19	2.71	0.00	23.90
Potential over injection into grid under net feed in ($\mathbf{E_{ifi}}$ = E_{gen1} - E_{cfi})	MUs	18.43	6.08	187.48	211.99

If 80% self consumption on potential energy generation (Egen1 of HV-1) is considered it comes out to be 298.17 Mus, which is higher than actual energy requirement (Et of HV-1) of 185.24 Mus. Hence, the self-consumption is limited to maximum requirement.

4.7 As can be seen from above table, in case of LMV-4A and LMV-4B, the energy requirement is higher than 80% of the generation considered for self-consumption. Therefore, there will be incentive to shift to Net Metering arrangement as the remaining energy, which was injected into grid can be

utilized to replace the purchase of energy from grid. Accordingly, there will be incentive to shift to Net Metering arrangement. However, in case of HV-1, the consumers are already fulfilling their entire requirement from net feed-in arrangement and surplus energy is being injected into the grid. This surplus that is available under net feed-in arrangement will be available under net metering arrangement as well. Hence, on account of low energy consumption requirement, there will be no impact on UPPCL from the conversion of such consumers. Accordingly, for the purposes of impact computation only the impact of shift under LMV-4A and LMV-4B consumers has been considered. The loss for Discoms because of migration of consumers of LMV-4A and LMV-4B consumer categories, under net feed-in arrangement, is shown below:

Loss for Discoms under Net Feed-In arrangement based on details from the tables in point 4.5 and 4.6

		LMV-4A	**LMV-4B**	**Total**
Loss of revenue to Discom R1 = (E_t – E_{bfi})* T3/10	Rs. Crore	60.83	21.90	82.73
Payment made to consumers due to potential over injection under net feed in P1 = E_{ifi} * T2/10	Rs. Crore	6.60	2.17	8.77
Net Loss to Discoms N1 = R1 +P1	Rs. Crore	67.43	24.07	91.50

4.8 Similarly, the impact in case of net metering arrangement is shown below:

Loss for Discoms under net metering arrangement based on details from the table in point 4.5

		LMV-4A	**LMV-4B**	**Total**
Energy Consumed from RSPV $\mathbf{E_{cnm}}$ = *If Total Energy Requirement (E_t) > Potential Energy Generation (E_{gen1}) Then E_{cnm} = Potential Energy Generation (E_{gen1}) Else $E_{bnm} = E_t$*	MUs	92.17	27.04	121.96
Energy Billed by Discom under net metering arrangement ($\mathbf{E_{bnm}}$) = *Total Energy Requirement (E_t) - E_{cnm}*	MUs	2.76	0.00	2.76
Energy injected into grid due to over injection under net metering arrangement ($\mathbf{E_{inm}}$) If Potential *Energy Generation (E_{gen1}) > Total Energy Requirement (E_t)*	MUs	0.00	3.38	3.38

Then E_{inm} = Potential *Energy Generation (E_{gen1}) - Total Energy Requirement (E_t)* Else E_{inm} = 0				
Loss of revenue to Discom R2 = (Et – E_{bnm})* T3/10	Rs. Crore	76.04	24.33	100.37
Payment made to consumers due to over injection under net feed in P2 = E_{inm} * T2/10	Rs. Crore	0.00	0.68	0.68
Net Loss to Discoms N2 = R2 +P2	Rs. Crore	76.04	25.01	101.04

4.9 Accordingly, the impact of shift of LMV-4A and LMV-4B consumers under net feed-in and net metering arrangement has been compared below to demonstrate the impact of present amendment on existing regulatory dispensation because at present, all consumers considered in the amendment are eligible for net feed-in whereas, subsequent to amendment they will also become eligible for net metering arrangement.

Comparison of impact of net feed-in and net metering arrangement

		Under Net Feed In	**Under Net Metering**	**Increase/ (Decrease) in Loss**
Loss of revenue to Discom	Rs. Crore	82.73	100.37	17.64
Payment made to consumers due to over injection under net feed in	Rs. Crore	8.77	0.68	(8.09)
Net Loss to Discoms	Rs. Crore	91.50	101.04	9.54*

**The net loss to Disoms has been considered at a conversion rate of 10% from Net Feed-In into Net Metering arrangement. If 25% conversion is considered, then the Net Loss to Discoms shall be Rs. 23.85 Cr.*

4.10 Further, there will be no saving in terms of power purchase as the total energy generated from RSPV system that contributed towards reduction in power purchase under Net Feed-In arrangement is same in case of Net Metering arrangement also.

5. Benefits to Licensee

5.1 With proposed amendments, it is expected that number of consumers having RSPV will increase in the Govt. institutions and commercial

institutions under LMV-4A and LMV-4B categories. As a result, there will be benefits accruing to the licensee as below:

As per Regulation 12.2 of UPERC (Rooftop Solar PV Grid Interactive System Gross/ Net Metering) Regulation, 2019, the total quantum of solar electricity generated under Net Metering, Net Billing / Net Feed-In arrangement by eligible consumer, who is not defined as obligated entity, shall qualify towards Renewable Purchase Obligation (RPO) for the Distribution Licensee in whose area of supply the eligible consumer is located. Allowing Net Metering arrangement will contribute towards increase in RPO compliance by the Distribution Licensee. The impact of above benefit has not been considered in above analysis. In other words, the loss that has been quantified in the above illustrations will reduce further.

6. Treatment/ Regulatory View

6.1 It is clear from the above discussion that while the proposed amendments provide flexibility to Govt. institutions and educational institutions to opt for Net Metering arrangement, the revenue loss to Discoms is minimal. The proper treatment of this small impact will be carried out at the time of carrying out the true-up exercise However, if due to variations in the trend of billing determinants, it is observed that the impact increases and attains a significant level, it will be prudent to have subsidy arrangement from the State Government as the proposed amendments are being carried out to uphold the spirit of Uttar Pradesh Solar Policy 2022.